Abstract Submitted for the MAR12 Meeting of The American Physical Society

Molecular packing in bone collagen fibrils prior to mineralization BENJAMIN HSIAO¹, Stony Brook University, HONG-WEN ZHOU², Stony Brook University, CHRISTIAN BURGER³, BENJAMIN CHU⁴, Stony Brook University, MELVIN J. GLIMCHER⁵, Harvard Medical School — The three-dimensional packing of collagen molecules in bone collagen fibrils has been largely unknown because even in moderately mineralized bone tissues, the organic matrix structure is severely perturbed by the deposition of mineral crystals. During the past decades, the structure of tendon collagen (e.g. rat tail) — a tissue that cannot mineralize in vivo, has been assumed to be representative for bone collagen fibrils. Small-angle X-ray diffraction analysis of the native, uncalcified intramuscular fish bone has revealed a new molecular packing scheme, significantly different from the quasi-hexagonal arrangement often found in tendons. The deduced structure in bone collagen fibrils indicates the presence of spatially discrete microfibrils, and an arrangement of intrafibrillar space to form "channels", which could accommodate crystals with dimensions typically found in bone apatite.

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Date submitted: 16 Nov 2011

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